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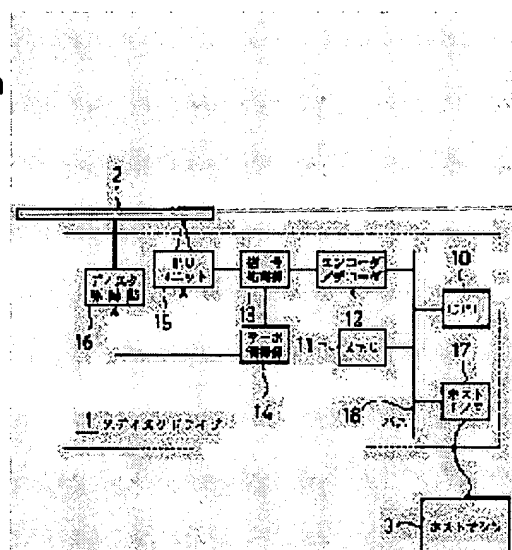
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(54) OPTICAL INFORMATION-RECORDING/REPRODUCING APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To more correctly obtain an optimum recording power for recording data by trial writing with use of a data area, and reduce deterioration of the data area by lessening an amount of the trial writing to the data area.

SOLUTION: A CPU 10 executes trial writing and records a test signal with changing a recording laser power stepwise to a trial write area on an optical disk 2, detects a reproduction state of the trial written and recorded test signal, and obtains a reference value of an optimum recording power. The test signal is trial written and recorded to a data area on the optical disk 2 while the recording laser power is changed stepwise centering the reference value of the optimum recording power. The reproduction state of the trial written and recorded test signal is detected, whereby the optimum recording power is obtained.



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CLAIMS

[Claim(s)]

[Claim 1] In the optical information record regenerative apparatus which performs informational record and playback optically to a record medium The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on said record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by this means, and to calculate the reference value of the optimal record power, The trial writer stage for optimal record power decision which record laser power is gradually changed to the data area which writes in the data on said record medium focusing on the reference value of said optimal record power, and tries, writes and records a test signal on it, The optical information record regenerative apparatus characterized by establishing an optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by this means, and to ask for the optimal record power.

[Claim 2] In the optical information record regenerative apparatus which performs informational record and playback optically to a record medium The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on said record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by this means, and to calculate the reference value of the optimal record power, An optimal record power reference-value modification means to change the reference value of the optimal record power called for by said optimal record power reference-value decision means based on the linear velocity to the data area which writes in the data on said record medium, The trial writer stage for optimal record power decision which record laser power is gradually changed focusing on the reference value of the optimal record power changed into the data area which writes in the data on said record medium by said optimal record power reference-value modification means, and tries, writes and records a test signal, The optical information record regenerative apparatus characterized by establishing an optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by this means, and to ask for the optimal record power.

[Claim 3] The optical information record regenerative apparatus characterized by the thing which set it as said trial writer stage for optimal record power decision in a location to said data area which tries and writes, tries and writes the location of record and is different at every record, and for which it tried and wrote and the record positioning means was established in an optical information record regenerative apparatus according to claim 1 or 2.

[Claim 4] The optical information record regenerative apparatus characterized by the thing which receive said data area, which try, writes and eliminates after record the data of the field tried, written and recorded, and for which it tried and wrote and the record data elimination means was established in an optical information record regenerative apparatus according to claim 1 or 2.

[Claim 5] The optical information record regenerative apparatus characterized by establishing a means to reask for the optimal record power again when a radial distance of the field which tried, wrote and

recorded the test signal by said trial writer stage for optimal record power decision in the optical information record regenerative apparatus according to claim 1 or 2, and the field which performs the writing of data becomes more than constant value.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to optical information record regenerative apparatus, such as an optical disk unit which performs informational record and playback optically to record media, such as an optical disk.

[0002]

[Description of the Prior Art] Optically, at the time of record to the optical disk which can record informational, the optical disk drive which performs informational record and playback optically to an optical disk needs to amend elements, such as change of the property of an optical disk, the property of the laser diode (LD) of an optical disk drive, and luminescence power, and needs to record information on the optimal conditions.

[0003] Then, the power calibration field (PCA field) in the most inner circumference of an optical disk which it tries and writes and is a field is used, the record power of LD is changed gradually, an informational power calibration (trying and writing) is carried out, information is reproduced from an PCA field after that, the optimal record conditions, i.e., the optimal record power, search for from the condition of the regenerative signal, and information records on the data area of an optical disk based on the called-for optimal record power henceforth.

[0004] However, since an PCA field is located in the inner circumference of an optical disk, a radius location differs from the data area which writes in data actually. And if radius locations differ, it will become difficult for change of the medium property of LD property by the temperature change in an optical disk drive, an optic, and an optical disk etc. and change of the power on the disk side of the laser beam from LD by the tilt of an optical disk to arise, therefore to obtain the optimal record power exact only in an PCA field.

[0005] Then, in order to determine the optimal record power, without being dependent on the radius location of the optical disk in which an informational account rec/play student is possible conventionally, after perform the test record by the power calibration in the write-in location of the data area which records data and determining the optimal record power based on the result of the test record, the optical information record regenerative apparatus (for example, refer to JP,6-44563,A) which eliminates the data of the area recorded the account of a test is propose.

[0006]

[Problem(s) to be Solved by the Invention] However, in an optical information record regenerative apparatus which was mentioned above, since the count of rewriting to a rewritable archive medium had a limit, when the test record was performed in the area which records data actually, there was a problem that the count of rewriting to the field will decrease. Moreover, it is more desirable not to perform the writing of those other than data in a data area as much as possible by the writing of data, since the recording characteristic of the record section may deteriorate.

[0007] While this invention is made in view of the above-mentioned point and asking accuracy for the optimal record power at the time of data logging more by trial writing using a data area, it aims at the

thing which receive a data area and for which it tries and writes, an amount is lessened and degradation of a data area is reduced.

[0008]

[Means for Solving the Problem] In the optical information record regenerative apparatus which performs informational record and playback optically to a record medium in order that this invention may attain the above-mentioned object The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on the above-mentioned record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by the means, and to calculate the reference value of the optimal record power, The trial writer stage for optimal record power decision which record laser power is gradually changed to the data area which writes in the data on the above-mentioned record medium focusing on the reference value of the above-mentioned optimal record power, and tries, writes and records a test signal on it, An optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by the means, and to ask for the optimal record power is established.

[0009] Moreover, it sets to the optical information record regenerative apparatus which performs informational record and playback optically to a record medium. The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on the above-mentioned record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by the means, and to calculate the reference value of the optimal record power, An optimal record power reference-value modification means to change the reference value of the optimal record power called for by the above-mentioned optimal record power reference-value decision means based on the linear velocity to the data area which writes in the data on the above-mentioned record medium, The trial writer stage for optimal record power decision which record laser power is gradually changed focusing on the reference value of the optimal record power changed into the data area which writes in the data on the above-mentioned record medium by the above-mentioned optimal record power reference-value modification means, and tries, writes and records a test signal, It is good to establish an optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by the means, and to ask for the optimal record power.

[0010] Furthermore, in the above optical information record regenerative apparatus, it is good to form a trial writing record positioning means to set it as a location to the above-mentioned data area which tries, writes, tries and writes the location of record and is different at every record in the above-mentioned trial writer stage for optimal record power decision.

[0011] Moreover, in the above optical information record regenerative apparatus, it is good to establish a trial writing record data elimination means against the above-mentioned data area to try, to write and to eliminate after record the data of the field tried, written and recorded.

[0012] Furthermore, in the above optical information record regenerative apparatus, when a radial distance of the field which tried, wrote and recorded the test signal by the above-mentioned trial writer stage for optimal record power decision, and the field which performs the writing of data becomes more than constant value, it is good to establish a means to reask for the optimal record power again.

[0013] The optical information record regenerative apparatus of claim 1 of this invention The reference value of the optimal record power is calculated by trial writing to a trial writing field. Since the range to which record power is changed is narrowed down and it asks for the optimal record power by the smaller count of trial writing in case [in which a data area is received based on the reference value] it tries and writes the optimal record power to a data-logging location -- more -- accuracy -- it can ask -- in addition -- and reduction which is degradation and the count of rewriting of a data area can be suppressed.

[0014] The optical information record regenerative apparatus of claim 2 of this invention The reference value of the optimal record power is calculated by trial writing to a trial writing field. Based on the linear velocity to a data area, amend and change the reference value, and the range to which record

power is changed in case [in which a data area is received based on the changed reference value] it tries and writes is narrowed down more for a short time. little optimal record power [as opposed to / since it tries and writes and asks for the optimal record power by the count / a data-logging location] -- more -- accuracy -- and a short time -- it can ask -- in addition -- and reduction which is degradation and the count of rewriting of a data area can be suppressed.

[0015] Since the optical information record regenerative apparatus of claim 3 of this invention performs trial writing in a location different each time in case [in which a data area is received] it tries and writes, it can prevent that only the same field in a data area deteriorates more remarkably than other fields.

[0016] Since the optical information record regenerative apparatus of claim 4 of this invention eliminates the test signal written [was tried and] and carried out to the data area, it can minimize that degradation of the write-in property of a field written [was tried and] and carried out.

[0017] Since the optical information record regenerative apparatus of claim 5 of this invention reasks for the optimal record power again when the record location when asking for the data-logging location and the optimal record power of a record medium is greatly far apart, it can write in data by the always exact optimal record power.

[0018]

[Operation and the gestalt] of invention Hereafter, the gestalt of implementation of this invention is concretely explained based on a drawing. Drawing 1 is drawing showing the configuration of the optical disk drive which is 1 operation gestalt of the optical information record regenerative apparatus of this invention.

[0019] This optical disk drive 1 is equipment which connects the host machines 3, such as a personal computer realized with the microcomputer which consists of CPU, a ROM, RAM, etc., and performs the record and playback of optical information to the optical disk 2 which are record media, such as a CD-RW disk, based on the directions from that host machine 3.

[0020] A microcomputer realizes, this optical disk drive 1 consists of CPU10, memory 11, the encoder/decoder 12, the signal-processing section 13, the servo control section 14, the pickup (PU) unit 15, a disk actuator 16, and host interface (I/F) 17 grade, and they are mutually connected possible [an exchange of data] through the bus 18.

[0021] CPU10 manages control of this optical whole disk drive 1, and it is performing optimal record power decision processing at the time of data logging in connection with this invention while an encoder / decoder 12, the signal-processing section 13, the servo control section 14, the PU unit 15, the disk actuator 16, host I/F17, etc. control each block by performing the firmware program on memory 11.

[0022] It is the storage means of RAM etc. which can be written, and memory 11 offers the working area at the time of CPU10 performing various kinds of processings, and is a thing with a host machine 3 used for data transmission and reception while it stores a firmware program.

[0023] The digital signal inputted from the signal-processing section 13 is decoded at the time of data playback, and an encoder / decoder 12 performs processing sent to CPU10 or memory 11 as user data, and at the time of data logging, it encodes to the data array when recording the user data sent through a bus 18 from host I/F17 on an optical disk 2, and it performs processing which sends to the signal-processing section 13.

[0024] The signal from the PU unit 15 is detected at the time of data playback, and the signal-processing section 13 performs processing which transmits the data read in the optical disk 2 to the decoder of an encoder / decoder 12 while notifying the PU unit 15 and the data which control the disk actuator 16 to the servo control section 14.

[0025] Moreover, at the time of data logging, similarly the signal from the PU unit 15 is detected, and processing which transmits the data sent from the encoder of an encoder / decoder 12 to the PU unit 15 is performed while notifying the PU unit 15 and the data which control the disk actuator 16 to the servo control section 14.

[0026] The servo control section 14 performs control of the PU unit 15 and the disk actuator 16 based on

the data calculated by the signal-processing section 13. For example, position control of the PU unit 15, power adjustment of the laser diode (LD) which is the laser light source of the PU unit 15, speed control of the spindle motor of the disk actuator 16, etc. are processed.

[0027] The PU unit 15 is a unit which has LD which is a laser light source, irradiates a laser beam on an optical disk 2, and reads data with the reflection factor of the return light. And at the time of data playback, processing which transmits the data read from the optical disk 2 to the signal-processing section 13 is performed.

[0028] Moreover, at the time of data writing, a laser beam is irradiated by the fixed wave pattern to an optical disk 2, and processing which writes the data sent from the signal-processing section 13 in an optical disk 2 is performed. Furthermore, at the time of the writing of data, and playback, processing of seeking which moves the unit containing LD itself to reading / write-in location on an optical disk 2 simultaneously, tracking, focusing, etc. is also performed.

[0029] The disk actuator 16 controls the rotational speed of an optical disk 2 based on the signal sent from the servo control section 14. Host I/F17 is bearing the interface with a host machine 3, and performs processing which transmits the user data with which the user data received from the host machine 3 are sent to the encoder of an encoder / decoder 12 from the decoder of an encoder / decoder 12 at the time of the data playback from delivery and an optical disk 2 to a host machine 3 at the time of data logging to an optical disk 2.

[0030] Namely, in order that this optical disk drive 1 may realize the optical information record regenerative apparatus in connection with claim 1 of this invention, The above CPU 10, the encoder/decoder 12, the signal-processing section 13, the servo control section 14, and PU unit 15 grade The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on a record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by the trial writer stage for reference-value decision, and to calculate the reference value of the optimal record power, The trial writer stage for optimal record power decision which record laser power is gradually changed to the data area which writes in the data on a record medium focusing on the reference value of the optimal record power, and tries, writes and records a test signal on it, The function of an optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by the trial writer stage for optimal record power decision, and to ask for the optimal record power is achieved, respectively.

[0031] Furthermore, a trial writing record positioning means to set it as a location to a data area which tries, writes, tries and writes the location of record and is different at every record, A trial writing record data elimination means against a data area to try and write and to eliminate after record the data of the field tried, written and recorded, When a radial distance of the field which tried, wrote and recorded the test signal by the trial writer stage for optimal record power decision, and the field which performs the writing of data becomes more than constant value, the function of a means to reask for the optimal record power again is also achieved.

[0032] Moreover, in order that this optical disk drive 1 may realize the optical information record regenerative apparatus in connection with claim 2 of this invention, The above CPU 10, the encoder/decoder 12, the signal-processing section 13, the servo control section 14, and PU unit 15 grade The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on a record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by the trial writer stage for reference-value decision, and to calculate the reference value of the optimal record power, An optimal record power reference-value modification means to change the reference value of the optimal record power called for by the optimal record power reference-value decision means based on the linear velocity to the data area which writes in the data on a record medium, The trial writer stage for optimal record power decision which record laser power is gradually changed focusing on the reference value of the optimal record power changed into the data area which writes in the data on a record medium by the optimal record power reference-value modification means,

and tries, writes and records a test signal, The function of an optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by the trial writer stage for optimal record power decision, and to ask for the optimal record power is achieved.

[0033] Drawing 2 is drawing showing a format of the record section of an optical disk 2. The record section of an optical disk 2 consists of the power calibration area (PCA field) 20, the program memory area (PMA field) 21, the lead-in groove area 22, a data area 23, and lead-out area 24.

[0034] The PCA field 20 is located in the most inner circumference of an optical disk 2, is a trial writing field used for trial writing of the test signal at the time of data logging, and calculates the reference value of the optimal record power using this trial writing field. The program memory area (Program Memory Area:PMA) field 21 is a field which stores the hysteresis of the data (information) recorded on the data area 23.

[0035] The lead-in groove area 22 is a field which stores the index information on the data recorded on the data area 23 etc. A data area 23 is a field which is located between the lead-in groove area 22 and the lead-out area 24, performs trial writing of a test signal based on the reference value of the optimal record power at the time of data logging, asks for the optimal record power, and records user data by the optimal record power. The lead-out area 24 is a field which stores the code which shows the termination of the record section of an optical disk 2.

[0036] Next, the optimal record power decision processing in connection with the optical information record regenerative apparatus of claim 1 of this invention in the above-mentioned optical disk drive 1 is explained. Drawing 3 is a flow chart which shows the optimal record power decision processing.

[0037] Drawing 4 is the diagram to an PCA field in which trying and writing and showing an example of change of LD record power at the time. Drawing 5 is the diagram to a data area in which trying and writing and showing an example of change of LD record power at the time.

[0038] As shown in drawing 3 , this optimal record power decision processing moves the PU unit 15 so that the exposure light of LD of the PU unit 15 may suit the write-in field of the PCA field 20 by the servo control section 14, in order to perform the writing tried and written to the PCA field 20 on an optical disk 2 at step ("S" shows among drawing) 1.

[0039] Although the test signal of the record pattern which progressed to step 2 and was defined beforehand is written in the PCA field 20, at this time, it is made to change gradually, as shown in drawing 4 , and the record power of LD is tried on two or more record power, and is written, and record is written in.

[0040] When optical disks 2 are phase change media, and the writing to an optical disk 2 impresses two kinds of power, record power and elimination power, by turns and uses the exposure of LD as a certain fixed wave pattern, a mark is formed on the record section of an optical disk 2.

[0041] Then, by progressing to step 3 and irradiating LD by predetermined playback power at the part tried, written and recorded on the PCA field 20, when the photodiode (Photo Diode:PD) in the PU unit 15 detects the reflected light, the data on an optical disk 2 can be read.

[0042] Since it progresses to step 4 and trial writing record of the test signal to the PCA field 20 is writing in data by two or more record power, the properties of a regenerative signal differ by each record power. Then, the property of a regenerative signal is detected and the record power which corresponds to the optimal thing in the property is determined as the reference value of the optimal record power.

[0043] For example, if it is made a wave which repeats the writing of a long mark and a short mark of a wave pattern, the reference value of the optimal record power can be easily calculated by asking for the average-value level of the regenerative signal of each mark at the time of playback, and detecting the difference.

[0044] That is, the regenerative signal with which the difference of average-value level becomes min out of two or more regenerative signals acquired by the above-mentioned trial writing is searched for, and the as opposed to [try and write and] record location record power from which the regenerative signal was acquired is determined as the reference value of the optimal record power. In each record power shown in drawing 4 , the record power of LD which gave and showed the drawing destructive line is the optimal record power reference value P0.

[0045] Next, it progresses to step 5 of drawing 3, and in order to perform the writing tried and written to the data area on an optical disk 2, the PU unit 15 is moved so that the exposure light of LD of the PU unit 15 may suit the write-in field of a data area by the servo control section 14. As it progresses to step 6 and is shown in drawing 5, the record power of LD is gradually changed within narrower limits focusing on the reference value of the optimal record power for which it asked in the PCA field 20, and a test signal is written in by two or more record power.

[0046] Since the reference value of the optimal record power is beforehand calculated in the PCA field 20 at this time, the need of enlarging distribution of LD record power in a data area 23 is lost, and trial writing can be performed only in a small region.

[0047] And by progressing to step 7 and irradiating LD by predetermined playback power at the part tried, written and recorded on the data area 23, when PD in the PU unit 15 detects the reflected light, the data of the test signal which tried on the data area on an optical disk 2, wrote, and was carried out are read.

[0048] It progresses to step 8, the property of each regenerative signal of the data of the test signal tried, written and recorded on the data area 23 is detected, and the record power which corresponds to the optimal thing in the property is determined as the optimal record power. For example, based on the reference value P0 of the optimal record power shown in drawing 4, as shown in drawing 5, it can depend, try, write and come out to five steps in the small region centering on the reference value P0 of the optimal record power, and can ask for the optimal record power.

[0049] Thus, accuracy can be asked for the optimal record power of a data write-in location rather than the optimal record power for which it asked in the PCA field 20, without using a data area 23 for a large quantity, since the value is made into a reference value and trial writing is carried out in a data area 23, after calculating the near value of the optimal record power using the PCA field 20.

[0050] Next, the optimal record power decision processing in connection with the optical information record regenerative apparatus of claim 2 of this invention in the above-mentioned optical disk drive 1 is explained. In an optical disk 2, the format from which linear velocity differs on inner circumference and a periphery exists. In this case, since a recording characteristic changes with radius locations with a natural thing, optimal LD power also changes with radius locations.

[0051] That is, since the reference value of the optimal record power for which it asked in the PCA field is the optimal record power in the radius location of an PCA field, it differs from the optimal record power of the field which records data actually. Then, it is good to change the reference value of the optimal record power according to the linear velocity of the field which writes in data actually.

[0052] This optimal record power decision processing moves the PU unit 15 so that the exposure light of LD of the PU unit 15 may suit the write-in field of the PCA field 20 by the servo control section 14, in order to perform the writing tried and written to the PCA field 20 on an optical disk 2.

[0053] Although the test signal of the record pattern defined beforehand is written in the PCA field 20, at this time, it is made to change gradually, as shown in drawing 4, and the record power of LD is tried on two or more record power, and is written, and record is written in.

[0054] Then, by irradiating LD by predetermined playback power at the part tried, written and recorded on the PCA field 20, the reflected light is detected by PD in the PU unit 15, the data on an optical disk 2 are read, the property of each regenerative signal is detected, and the record power which corresponds to the optimal thing in the property is determined as the reference value of the optimal record power. In each record power shown in drawing 4, the record power of LD which gave and showed the drawing destructive line is the optimal record power reference value P0.

[0055] Furthermore, based on the linear velocity to a data area, the reference value of the above-mentioned optimal record power is changed. Drawing 7 is the diagram to a data area in which trying and writing and showing other examples of change of LD record power at the time.

[0056] By applying amendment of constant twice etc. to the reference value P0 of the optimal record power shown in drawing 4, the reference value of the optimal record power is updated and the reference value P1 of the optimal record power after modification as shown in drawing 7 is used by trial writing record of the test signal in a data area 23.

[0057] And in order to perform the writing tried and written to the data area on an optical disk 2, the PU unit 15 is moved so that the exposure light of LD of the PU unit 15 may suit the write-in field of a data area by the servo control section 14.

[0058] Then, change the record power of LD gradually within narrower limits focusing on the reference value of the optimal record power after the above-mentioned modification, and a test signal is written in by two or more record power. By irradiating LD by predetermined playback power at the part tried, written and recorded on the data area 23, when PD in the PU unit 15 detects the reflected light, the data of the test signal which tried on the data area on an optical disk 2, wrote, and was carried out are read.

[0059] And the property of each regenerative signal of the data of the test signal tried, written and recorded on the data area 23 is detected, and the record power which corresponds to the optimal thing in the property is determined as the optimal record power.

[0060] Thus, since the reference value of the optimal record power obtained using the PCA field 20 is amended and changed according to the linear velocity to the field which carries out trial writing in the next data area 23, the value is made into a reference value, trial writing is carried out in a data area 23 and record power is changed within limits [near / the optimal record power], it can try and write to a data area 23, and processing can be finished in a short time.

[0061] Next, it concerns, tries and writes to the optical information record regenerative apparatus of claim 3 of this invention in the above-mentioned optical disk drive 1, and record position operation is explained. This processing is set as a location to a data area 23 which tries, writes, tries and writes the location of record and is different at every record.

[0062] Drawing 6 is drawing showing a format of the data area of an optical disk 2. It divides into n and $n+1$, and two or more zones 1, ..., the thing that asks for the optimal record power for one to n +every zone are taken for a data area 23 for an example.

[0063] For example, in the zone n of a data area 23, the first trial writing record is performed in Field m , and the first trial writing record is performed in Field k in a zone $n+1$. And at the time of trial writing record of a next test signal, it tries, and writes that it carries out in a field $m+1$ and a field $k+1$ in Zone n and a zone $n+1$, respectively, and a record location is changed at it. In this way, it tries, and writes that a field which is different whenever it performs trial writing of a test signal is used, and a record location is set up.

[0064] Thus, since the count which tries and writes in each zone of a data area 23 decreases, degradation of the recording characteristic by the increment in the count of rewriting to an optical disk 2 can be suppressed, and it can record by the optimal record power over a longer period.

[0065] Next, it concerns, tries and writes to the optical information record regenerative apparatus of claim 4 of this invention in the above-mentioned optical disk drive 1, and record data elimination processing is explained. This processing eliminates the data of that field tried, written and recorded after trial writing record of the test signal to a data area 23.

[0066] Since the large range of record power is taken when performing trial writing, in order to ask for the optimal record power using a data area 23 as mentioned above, the field recorded by high power rather than original record power also exists. And when overwriting to the field recorded by high power, there is a possibility that a recording characteristic may fall.

[0067] Then, after asking for the optimal record power by trial writing to a data area 23, degradation of a recording characteristic can be prevented by eliminating data once to the field which performed trial writing of a data area 23.

[0068] Next, the processing which reasks for the optimal record power in connection with the optical information record regenerative apparatus of claim 5 of this invention in the above-mentioned optical disk drive 1 is explained. This processing reasks for the optimal record power again, when a radial distance of the field which tried, wrote and recorded the test signal by trial writing processing for optimal record power decision, and the field which performs the writing of data becomes more than constant value.

[0069] If the radius locations of the field which records the field which carried out trial writing and data on an optical disk 2 differ in above-mentioned optimal record power decision processing Since the

property of the record medium of LD property by the temperature change in the optical disk drive 1, an optic, and an optical disk 2 changes or change of the power on the disk side of the laser beam from LD by the tilt of an optical disk 2 arises There is a possibility of stopping becoming an optimum value in the location where the obtained optimal record power records data.

[0070] Then, when separated more than constant value with the radius location of the field which records data, and the field which asked for the optimal record power, it judges that various kinds of properties differ, and reasks for the optimal record power by trial writing record in a data-logging location anew. Thus, it can always write in accuracy by the optimal power.

[0071]

[Effect of the Invention] As explained above, while asking accuracy for the optimal record power at the time of data logging more by trial writing using a data area according to the optical information record regenerative apparatus by this invention, the amount of trial writing to a data area can be lessened, and degradation of a data area can be reduced.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to optical information record regenerative apparatus, such as an optical disk unit which performs informational record and playback optically to record media, such as an optical disk.

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PRIOR ART

[Description of the Prior Art] Optically, at the time of record to the optical disk which can record informational, the optical disk drive which performs informational record and playback optically to an optical disk needs to amend elements, such as change of the property of an optical disk, the property of the laser diode (LD) of an optical disk drive, and luminescence power, and needs to record information on the optimal conditions.

[0003] Then, the power calibration field (PCA field) in the most inner circumference of an optical disk which it tries and writes and is a field is used, the record power of LD is changed gradually, an informational power calibration (trying and writing) is carried out, information is reproduced from an PCA field after that, the optimal record conditions, i.e., the optimal record power, search for from the condition of the regenerative signal, and information records on the data area of an optical disk based on the called-for optimal record power henceforth.

[0004] However, since an PCA field is located in the inner circumference of an optical disk, a radius location differs from the data area which writes in data actually. And if radius locations differ, it will become difficult for change of the medium property of LD property by the temperature change in an optical disk drive, an optic, and an optical disk etc. and change of the power on the disk side of the laser beam from LD by the tilt of an optical disk to arise, therefore to obtain the optimal record power exact only in an PCA field.

[0005] Then, in order to determine the optimal record power, without being dependent on the radius location of the optical disk in which an informational account rec/play student is possible conventionally, after perform the test record by the power calibration in the write-in location of the data area which records data and determining the optimal record power based on the result of the test record, the optical information record regenerative apparatus (for example, refer to JP,6-44563,A) which eliminates the data of the area recorded the account of a test is propose.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, while asking accuracy for the optimal record power at the time of data logging more by trial writing using a data area according to the optical information record regenerative apparatus by this invention, the amount of trial writing to a data area can be lessened, and degradation of a data area can be reduced.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in an optical information record regenerative apparatus which was mentioned above, since the count of rewriting to a rewritable archive medium had a limit, when the test record was performed in the area which records data actually, there was a problem that the count of rewriting to the field will decrease. Moreover, it is more desirable not to perform the writing of those other than data in a data area as much as possible by the writing of data, since the recording characteristic of the record section may deteriorate.

[0007] While this invention is made in view of the above-mentioned point and asking accuracy for the optimal record power at the time of data logging more by trial writing using a data area, it aims at the thing which receive a data area and for which it tries and writes, an amount is lessened and degradation of a data area is reduced.

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MEANS

[Means for Solving the Problem] In the optical information record regenerative apparatus which performs informational record and playback optically to a record medium in order that this invention may attain the above-mentioned object The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on the above-mentioned record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by the means, and to calculate the reference value of the optimal record power, The trial writer stage for optimal record power decision which record laser power is gradually changed to the data area which writes in the data on the above-mentioned record medium focusing on the reference value of the above-mentioned optimal record power, and tries, writes and records a test signal on it, An optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by the means, and to ask for the optimal record power is established.

[0009] Moreover, it sets to the optical information record regenerative apparatus which performs informational record and playback optically to a record medium. The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on the above-mentioned record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by the means, and to calculate the reference value of the optimal record power, An optimal record power reference-value modification means to change the reference value of the optimal record power called for by the above-mentioned optimal record power reference-value decision means based on the linear velocity to the data area which writes in the data on the above-mentioned record medium, The trial writer stage for optimal record power decision which record laser power is gradually changed focusing on the reference value of the optimal record power changed into the data area which writes in the data on the above-mentioned record medium by the above-mentioned optimal record power reference-value modification means, and tries, writes and records a test signal, It is good to establish an optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by the means, and to ask for the optimal record power.

[0010] Furthermore, in the above optical information record regenerative apparatus, it is good to form a trial writing record positioning means to set it as a location to the above-mentioned data area which tries, writes, tries and writes the location of record and is different at every record in the above-mentioned trial writer stage for optimal record power decision.

[0011] Moreover, in the above optical information record regenerative apparatus, it is good to establish a trial writing record data elimination means against the above-mentioned data area to try, to write and to eliminate after record the data of the field tried, written and recorded.

[0012] Furthermore, in the above optical information record regenerative apparatus, when a radial distance of the field which tried, wrote and recorded the test signal by the above-mentioned trial writer stage for optimal record power decision, and the field which performs the writing of data becomes more than constant value, it is good to establish a means to reask for the optimal record power again.

[0013] The optical information record regenerative apparatus of claim 1 of this invention The reference value of the optimal record power is calculated by trial writing to a trial writing field. Since the range to which record power is changed is narrowed down and it asks for the optimal record power by the smaller count of trial writing in case [in which a data area is received based on the reference value] it tries and writes the optimal record power to a data-logging location -- more -- accuracy -- it can ask -- in addition -- and reduction which is degradation and the count of rewriting of a data area can be suppressed.

[0014] The optical information record regenerative apparatus of claim 2 of this invention The reference value of the optimal record power is calculated by trial writing to a trial writing field. Based on the linear velocity to a data area, amend and change the reference value, and the range to which record power is changed in case [in which a data area is received based on the changed reference value] it tries and writes is narrowed down more for a short time. little optimal record power [as opposed to / since it tries and writes and asks for the optimal record power by the count / a data-logging location] -- more -- accuracy -- and a short time -- it can ask -- in addition -- and reduction which is degradation and the count of rewriting of a data area can be suppressed.

[0015] Since the optical information record regenerative apparatus of claim 3 of this invention performs trial writing in a location different each time in case [in which a data area is received] it tries and writes, it can prevent that only the same field in a data area deteriorates more remarkably than other fields.

[0016] Since the optical information record regenerative apparatus of claim 4 of this invention eliminates the test signal written [was tried and] and carried out to the data area, it can minimize that degradation of the write-in property of a field written [was tried and] and carried out.

[0017] Since the optical information record regenerative apparatus of claim 5 of this invention reasks for the optimal record power again when the record location when asking for the data-logging location and the optimal record power of a record medium is greatly far apart, it can write in data by the always exact optimal record power.

[0018]

[Operation and the gestalt] of invention Hereafter, the gestalt of implementation of this invention is concretely explained based on a drawing. Drawing 1 is drawing showing the configuration of the optical disk drive which is 1 operation gestalt of the optical information record regenerative apparatus of this invention.

[0019] This optical disk drive 1 is equipment which connects the host machines 3, such as a personal computer realized with the microcomputer which consists of CPU, a ROM, RAM, etc., and performs the record and playback of optical information to the optical disk 2 which are record media, such as a CD-RW disk, based on the directions from that host machine 3.

[0020] A microcomputer realizes, this optical disk drive 1 consists of CPU10, memory 11, the encoder/decoder 12, the signal-processing section 13, the servo control section 14, the pickup (PU) unit 15, a disk actuator 16, and host interface (I/F) 17 grade, and they are mutually connected possible [an exchange of data] through the bus 18.

[0021] CPU10 manages control of this optical whole disk drive 1, and it is performing optimal record power decision processing at the time of data logging in connection with this invention while an encoder / decoder 12, the signal-processing section 13, the servo control section 14, the PU unit 15, the disk actuator 16, host I/F17, etc. control each block by performing the firmware program on memory 11.

[0022] It is the storage means of RAM etc. which can be written, and memory 11 offers the working area at the time of CPU10 performing various kinds of processings, and is a thing with a host machine 3 used for data transmission and reception while it stores a firmware program.

[0023] The digital signal inputted from the signal-processing section 13 is decoded at the time of data playback, and an encoder / decoder 12 performs processing sent to CPU10 or memory 11 as user data, and at the time of data logging, it encodes to the data array when recording the user data sent through a bus 18 from host I/F17 on an optical disk 2, and it performs processing which sends to the signal-

processing section 13.

[0024] The signal from the PU unit 15 is detected at the time of data playback, and the signal-processing section 13 performs processing which transmits the data read in the optical disk 2 to the decoder of an encoder / decoder 12 while notifying the PU unit 15 and the data which control the disk actuator 16 to the servo control section 14.

[0025] Moreover, at the time of data logging, similarly the signal from the PU unit 15 is detected, and processing which transmits the data sent from the encoder of an encoder / decoder 12 to the PU unit 15 is performed while notifying the PU unit 15 and the data which control the disk actuator 16 to the servo control section 14.

[0026] The servo control section 14 performs control of the PU unit 15 and the disk actuator 16 based on the data calculated by the signal-processing section 13. For example, position control of the PU unit 15, power adjustment of the laser diode (LD) which is the laser light source of the PU unit 15, speed control of the spindle motor of the disk actuator 16, etc. are processed.

[0027] The PU unit 15 is a unit which has LD which is a laser light source, irradiates a laser beam on an optical disk 2, and reads data with the reflection factor of the return light. And at the time of data playback, processing which transmits the data read from the optical disk 2 to the signal-processing section 13 is performed.

[0028] Moreover, at the time of data writing, a laser beam is irradiated by the fixed wave pattern to an optical disk 2, and processing which writes the data sent from the signal-processing section 13 in an optical disk 2 is performed. Furthermore, at the time of the writing of data, and playback, processing of seeking which moves the unit containing LD itself to reading / write-in location on an optical disk 2 simultaneously, tracking, focusing, etc. is also performed.

[0029] The disk actuator 16 controls the rotational speed of an optical disk 2 based on the signal sent from the servo control section 14. Host I/F17 is bearing the interface with a host machine 3, and performs processing which transmits the user data with which the user data received from the host machine 3 are sent to the encoder of an encoder / decoder 12 from the decoder of an encoder / decoder 12 at the time of the data playback from delivery and an optical disk 2 to a host machine 3 at the time of data logging to an optical disk 2.

[0030] Namely, in order that this optical disk drive 1 may realize the optical information record regenerative apparatus in connection with claim 1 of this invention, The above CPU 10, the encoder/decoder 12, the signal-processing section 13, the servo control section 14, and PU unit 15 grade The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on a record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by the trial writer stage for reference-value decision, and to calculate the reference value of the optimal record power, The trial writer stage for optimal record power decision which record laser power is gradually changed to the data area which writes in the data on a record medium focusing on the reference value of the optimal record power, and tries, writes and records a test signal on it, The function of an optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by the trial writer stage for optimal record power decision, and to ask for the optimal record power is achieved, respectively.

[0031] Furthermore, a trial writing record positioning means to set it as a location to a data area which tries, writes, tries and writes the location of record and is different at every record, A trial writing record data elimination means against a data area to try and write and to eliminate after record the data of the field tried, written and recorded, When a radial distance of the field which tried, wrote and recorded the test signal by the trial writer stage for optimal record power decision, and the field which performs the writing of data becomes more than constant value, the function of a means to reask for the optimal record power again is also achieved.

[0032] Moreover, in order that this optical disk drive 1 may realize the optical information record regenerative apparatus in connection with claim 2 of this invention, The above CPU 10, the encoder/decoder 12, the signal-processing section 13, the servo control section 14, and PU unit 15 grade

The trial writer stage for reference-value decision which record laser power is gradually changed to the trial writing field on a record medium, and tries, writes and records a test signal on it, An optimal record power reference-value decision means to detect the playback condition of the test signal tried, written and recorded by the trial writer stage for reference-value decision, and to calculate the reference value of the optimal record power, An optimal record power reference-value modification means to change the reference value of the optimal record power called for by the optimal record power reference-value decision means based on the linear velocity to the data area which writes in the data on a record medium, The trial writer stage for optimal record power decision which record laser power is gradually changed focusing on the reference value of the optimal record power changed into the data area which writes in the data on a record medium by the optimal record power reference-value modification means, and tries, writes and records a test signal, The function of an optimal record power decision means to detect the playback condition of the test signal tried, written and recorded by the trial writer stage for optimal record power decision, and to ask for the optimal record power is achieved.

[0033] Drawing 2 is drawing showing a format of the record section of an optical disk 2. The record section of an optical disk 2 consists of the power calibration area (PCA field) 20, the program memory area (PMA field) 21, the lead-in groove area 22, a data area 23, and lead-out area 24.

[0034] The PCA field 20 is located in the most inner circumference of an optical disk 2, is a trial writing field used for trial writing of the test signal at the time of data logging, and calculates the reference value of the optimal record power using this trial writing field. The program memory area (Program Memory Area:PMA) field 21 is a field which stores the hysteresis of the data (information) recorded on the data area 23.

[0035] The lead-in groove area 22 is a field which stores the index information on the data recorded on the data area 23 etc. A data area 23 is a field which is located between the lead-in groove area 22 and the lead-out area 24, performs trial writing of a test signal based on the reference value of the optimal record power at the time of data logging, asks for the optimal record power, and records user data by the optimal record power. The lead-out area 24 is a field which stores the code which shows the termination of the record section of an optical disk 2.

[0036] Next, the optimal record power decision processing in connection with the optical information record regenerative apparatus of claim 1 of this invention in the above-mentioned optical disk drive 1 is explained. Drawing 3 is a flow chart which shows the optimal record power decision processing.

[0037] Drawing 4 is the diagram to an PCA field in which trying and writing and showing an example of change of LD record power at the time. Drawing 5 is the diagram to a data area in which trying and writing and showing an example of change of LD record power at the time.

[0038] As shown in drawing 3 , this optimal record power decision processing moves the PU unit 15 so that the exposure light of LD of the PU unit 15 may suit the write-in field of the PCA field 20 by the servo control section 14, in order to perform the writing tried and written to the PCA field 20 on an optical disk 2 at step ("S" shows among drawing) 1.

[0039] Although the test signal of the record pattern which progressed to step 2 and was defined beforehand is written in the PCA field 20, at this time, it is made to change gradually, as shown in drawing 4 , and the record power of LD is tried on two or more record power, and is written, and record is written in.

[0040] When optical disks 2 are phase change media, and the writing to an optical disk 2 impresses two kinds of power, record power and elimination power, by turns and uses the exposure of LD as a certain fixed wave pattern, a mark is formed on the record section of an optical disk 2.

[0041] Then, by progressing to step 3 and irradiating LD by predetermined playback power at the part tried, written and recorded on the PCA field 20, when the photodiode (Photo Diode:PD) in the PU unit 15 detects the reflected light, the data on an optical disk 2 can be read.

[0042] Since it progresses to step 4 and trial writing record of the test signal to the PCA field 20 is writing in data by two or more record power, the properties of a regenerative signal differ by each record power. Then, the property of a regenerative signal is detected and the record power which corresponds to the optimal thing in the property is determined as the reference value of the optimal record power.

[0043] For example, if it is made a wave which repeats the writing of a long mark and a short mark of a wave pattern, the reference value of the optimal record power can be easily calculated by asking for the average-value level of the regenerative signal of each mark at the time of playback, and detecting the difference.

[0044] That is, the regenerative signal with which the difference of average-value level becomes min out of two or more regenerative signals acquired by the above-mentioned trial writing is searched for, and the as opposed to [try and write and] record location record power from which the regenerative signal was acquired is determined as the reference value of the optimal record power. In each record power shown in drawing 4 , the record power of LD which gave and showed the drawing destructive line is the optimal record power reference value P0.

[0045] Next, it progresses to step 5 of drawing 3 , and in order to perform the writing tried and written to the data area on an optical disk 2, the PU unit 15 is moved so that the exposure light of LD of the PU unit 15 may suit the write-in field of a data area by the servo control section 14. As it progresses to step 6 and is shown in drawing 5 , the record power of LD is gradually changed within narrower limits focusing on the reference value of the optimal record power for which it asked in the PCA field 20, and a test signal is written in by two or more record power.

[0046] Since the reference value of the optimal record power is beforehand calculated in the PCA field 20 at this time, the need of enlarging distribution of LD record power in a data area 23 is lost, and trial writing can be performed only in a small region.

[0047] And by progressing to step 7 and irradiating LD by predetermined playback power at the part tried, written and recorded on the data area 23, when PD in the PU unit 15 detects the reflected light, the data of the test signal which tried on the data area on an optical disk 2, wrote, and was carried out are read.

[0048] It progresses to step 8, the property of each regenerative signal of the data of the test signal tried, written and recorded on the data area 23 is detected, and the record power which corresponds to the optimal thing in the property is determined as the optimal record power. For example, based on the reference value P0 of the optimal record power shown in drawing 4 , as shown in drawing 5 , it can depend, try, write and come out to five steps in the small region centering on the reference value P0 of the optimal record power, and can ask for the optimal record power.

[0049] Thus, accuracy can be asked for the optimal record power of a data write-in location rather than the optimal record power for which it asked in the PCA field 20, without using a data area 23 for a large quantity, since the value is made into a reference value and trial writing is carried out in a data area 23, after calculating the near value of the optimal record power using the PCA field 20.

[0050] Next, the optimal record power decision processing in connection with the optical information record regenerative apparatus of claim 2 of this invention in the above-mentioned optical disk drive 1 is explained. In an optical disk 2, the format from which linear velocity differs on inner circumference and a periphery exists. In this case, since a recording characteristic changes with radius locations with a natural thing, optimal LD power also changes with radius locations.

[0051] That is, since the reference value of the optimal record power for which it asked in the PCA field is the optimal record power in the radius location of an PCA field, it differs from the optimal record power of the field which records data actually. Then, it is good to change the reference value of the optimal record power according to the linear velocity of the field which writes in data actually.

[0052] This optimal record power decision processing moves the PU unit 15 so that the exposure light of LD of the PU unit 15 may suit the write-in field of the PCA field 20 by the servo control section 14, in order to perform the writing tried and written to the PCA field 20 on an optical disk 2.

[0053] Although the test signal of the record pattern defined beforehand is written in the PCA field 20, at this time, it is made to change gradually, as shown in drawing 4 , and the record power of LD is tried on two or more record power, and is written, and record is written in.

[0054] Then, by irradiating LD by predetermined playback power at the part tried, written and recorded on the PCA field 20, the reflected light is detected by PD in the PU unit 15, the data on an optical disk 2 are read, the property of each regenerative signal is detected, and the record power which corresponds to

the optimal thing in the property is determined as the reference value of the optimal record power. In each record power shown in drawing 4, the record power of LD which gave and showed the drawing destructive line is the optimal record power reference value P0.

[0055] Furthermore, based on the linear velocity to a data area, the reference value of the above-mentioned optimal record power is changed. Drawing 7 is the diagram to a data area in which trying and writing and showing other examples of change of LD record power at the time.

[0056] By applying amendment of constant twice etc. to the reference value P0 of the optimal record power shown in drawing 4, the reference value of the optimal record power is updated and the reference value P1 of the optimal record power after modification as shown in drawing 7 is used by trial writing record of the test signal in a data area 23.

[0057] And in order to perform the writing tried and written to the data area on an optical disk 2, the PU unit 15 is moved so that the exposure light of LD of the PU unit 15 may suit the write-in field of a data area by the servo control section 14.

[0058] Then, change the record power of LD gradually within narrower limits focusing on the reference value of the optimal record power after the above-mentioned modification, and a test signal is written in by two or more record power. By irradiating LD by predetermined playback power at the part tried, written and recorded on the data area 23, when PD in the PU unit 15 detects the reflected light, the data of the test signal which tried on the data area on an optical disk 2, wrote, and was carried out are read.

[0059] And the property of each regenerative signal of the data of the test signal tried, written and recorded on the data area 23 is detected, and the record power which corresponds to the optimal thing in the property is determined as the optimal record power.

[0060] Thus, since the reference value of the optimal record power obtained using the PCA field 20 is amended and changed according to the linear velocity to the field which carries out trial writing in the next data area 23, the value is made into a reference value, trial writing is carried out in a data area 23 and record power is changed within limits [near / the optimal record power], it can try and write to a data area 23, and processing can be finished in a short time.

[0061] Next, it concerns, tries and writes to the optical information record regenerative apparatus of claim 3 of this invention in the above-mentioned optical disk drive 1, and record position operation is explained. This processing is set as a location to a data area 23 which tries, writes, tries and writes the location of record and is different at every record.

[0062] Drawing 6 is drawing showing a format of the data area of an optical disk 2. It divides into n and n+1, and two or more zones 1, ..., the thing that asks for the optimal record power for one to n+every zone are taken for a data area 23 for an example.

[0063] For example, in the zone n of a data area 23, the first trial writing record is performed in Field m, and the first trial writing record is performed in Field k in a zone n+1. And at the time of trial writing record of a next test signal, it tries, and writes that it carries out in a field m+1 and a field k+1 in Zone n and a zone n+1, respectively, and a record location is changed at it. In this way, it tries, and writes that a field which is different whenever it performs trial writing of a test signal is used, and a record location is set up.

[0064] Thus, since the count which tries and writes in each zone of a data area 23 decreases, degradation of the recording characteristic by the increment in the count of rewriting to an optical disk 2 can be suppressed, and it can record by the optimal record power over a longer period.

[0065] Next, it concerns, tries and writes to the optical information record regenerative apparatus of claim 4 of this invention in the above-mentioned optical disk drive 1, and record data elimination processing is explained. This processing eliminates the data of that field tried, written and recorded after trial writing record of the test signal to a data area 23.

[0066] Since the large range of record power is taken when performing trial writing, in order to ask for the optimal record power using a data area 23 as mentioned above, the field recorded by high power rather than original record power also exists. And when overwriting to the field recorded by high power, there is a possibility that a recording characteristic may fall.

[0067] Then, after asking for the optimal record power by trial writing to a data area 23, degradation of a

recording characteristic can be prevented by eliminating data once to the field which performed trial writing of a data area 23.

[0068] Next, the processing which reasks for the optimal record power in connection with the optical information record regenerative apparatus of claim 5 of this invention in the above-mentioned optical disk drive 1 is explained. This processing reasks for the optimal record power again, when a radial distance of the field which tried, wrote and recorded the test signal by trial writing processing for optimal record power decision, and the field which performs the writing of data becomes more than constant value.

[0069] If the radius locations of the field which records the field which carried out trial writing and data on an optical disk 2 differ in above-mentioned optimal record power decision processing Since the property of the record medium of LD property by the temperature change in the optical disk drive 1, an optic, and an optical disk 2 changes or change of the power on the disk side of the laser beam from LD by the tilt of an optical disk 2 arises There is a possibility of stopping becoming an optimum value in the location where the obtained optimal record power records data.

[0070] Then, when separated more than constant value with the radius location of the field which records data, and the field which asked for the optimal record power, it judges that various kinds of properties differ, and reasks for the optimal record power by trial writing record in a data-logging location anew. Thus, it can always write in accuracy by the optimal power.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the configuration of the optical disk drive which is 1 operation gestalt of the optical information record regenerative apparatus of this invention.

[Drawing 2] It is drawing showing a format of the record section of the optical disk shown in drawing 1.

[Drawing 3] It is the flow chart which shows the optimal record power decision processing in connection with the optical information record regenerative apparatus of claim 1 of this invention in the optical disk drive shown in drawing 1.

[Drawing 4] It is the diagram to the PCA field of the optical disk in the optical disk drive shown in drawing 1 in which trying and writing and showing an example of change of LD record power at the time.

[Drawing 5] It is the diagram to the data area of the optical disk in the optical disk drive shown in drawing 1 in which trying and writing and showing an example of change of LD record power at the time.

[Drawing 6] It is drawing showing a format of the data area of the optical disk shown in drawing 1.

[Drawing 7] It is the diagram to a data area in which trying and writing and showing other examples of change of LD record power at the time.

[Description of Notations]

1: Optical disk drive 2: Optical disk

3: Host machine 10: CPU

11: Memory 18: Bus

12: An encoder/decoder

13: Signal-processing section 14: Servo control section

15: Pickup (PU) unit

16: Disk actuator

17: Host interface (I/F)

20: Power calibration area (PCA field)

21: Program memory area (PMA field)

22: Lead-in groove area 23: Data area

24: Lead-out area

P0: The reference value of the optimal record power

P1: The reference value of the optimal record power after modification

[Translation done.]

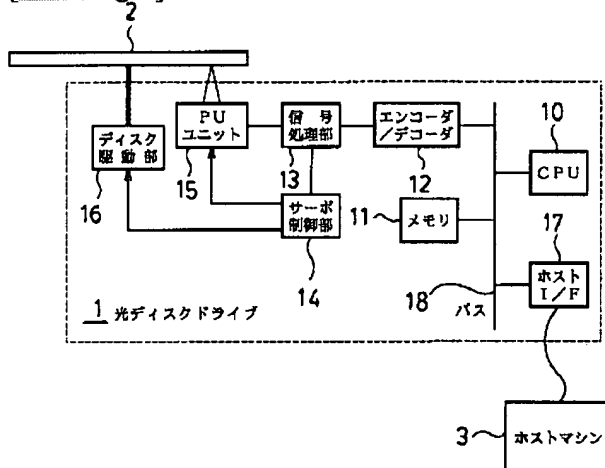
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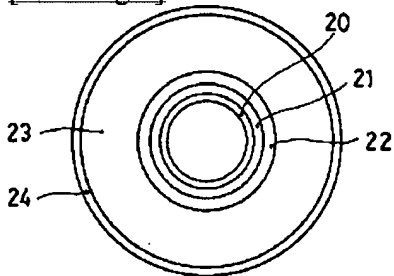
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DRAWINGS

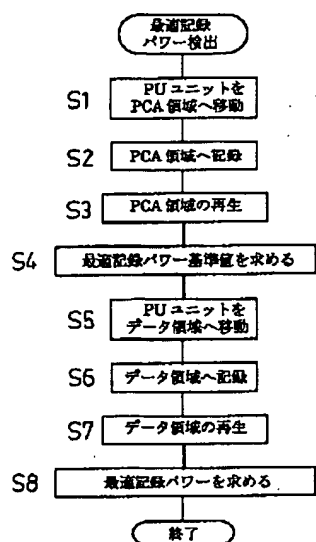
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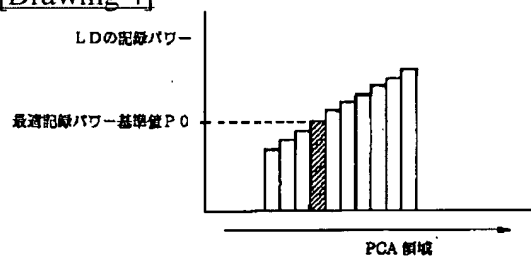
[Drawing 2]



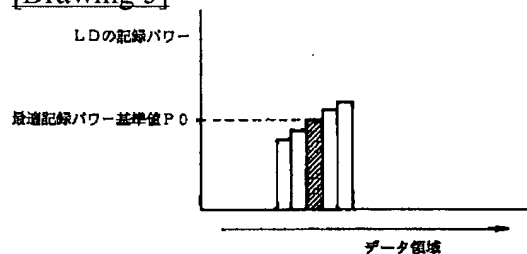
[Drawing 3]



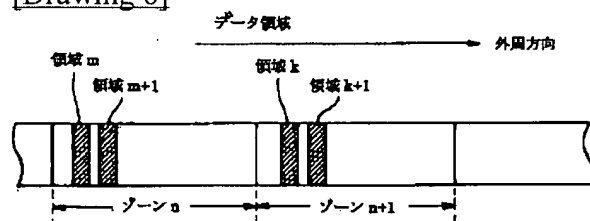
[Drawing 4]



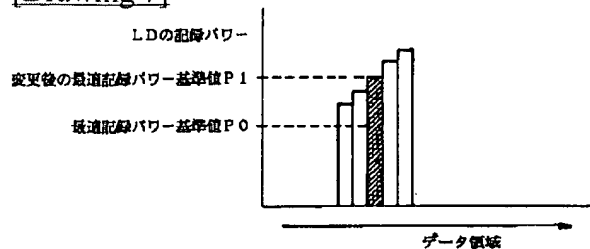
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Translation done.]